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DISTRICT 6
INDUSTRY SURVEYS

ATLANTIC RICHFIELD REFINING CO. Box 849 Port Arthur, Texas 77640

Permit No. 00491

SURVEY: November 1, 1967 by Marshall Elliott and Larry Smaihall

PERSONNEL, Contacted: Plant Manager T.V. Griffith; Supervisor, Engineering G.K. Hoff.
Not Available: Gen. Supt. J.S. Dana; Operations Supt. C.L. Riegner; Eng. Supt. C.M. Southern.

PLANT DATA: Location; west bank of Neches River to FM Road 366, north of TexHwy 87.
Employees; Day hours, Mon. thru Fri. 325. Each shift 50, about 225 total. Total 550.
Capacity; 84,000 bbl./day of crude oil.
Products; LPG, Gasoline, Specialty Naphthas, Kerosene, Distillate Fuels, Residual fuels, Detergent Alkylates
Process Units; 1 Crude Still, 1 Thermal Vis Breaker, 1 FCC, 2 Catalytic Reformers (including Aromatics Fractionation and Hydro-dealkylation), Hydro-desulfurizer for distillate fuels, Alkylation Unit (sulfuric acid) for gasoline production, Propylene Polymerization (and polymer fractionation), Sulfur Recovery Unit (from H₂S), Caustic Wash Unit on FCC distillate, Detergent Alkylate Unit.

WATER SUPPLY: From Neches River; About 3000 gpm is used for cooling in the Visbreaker Unit. From LNVA; Average 3.5 MG/D, fairly constant. About half is used directly for cooling tower make-up; the rest is clarified with alum and filtered for boiler water and process use. Part of the boiler feed water is softened by ion exchange using NaCl regeneration; the rest is demineralized by ion exchange.

WASTE WATER: All water from the plant, including rain water is discharged thru:

1. The "Country Club Ditch", a small ditch running thru company owned, vacant property north of the process area and discharging into the swamp. This swamp, about 1 mile wide, lies between the refinery area and the river. This ditch receives only the waste from the Demineralizing Unit, alternately dilute sulfuric acid and dilute NaOH, with the day-long balance on the acid side. Plans are now made to transfer this stream to the "South Ditch".
2. The "South Separator", an earthen pit which receives rain run-off, and tank draw water from the tank farm which comprises the south half of the refinery area. It also receives the waste water, 100 gpm, from the Detergent Alkylate unit. Water from the separator discharges into the swamp.
3. The main outfall canal which discharges into the river about 1 mile north of the Ry. 87 bridge. This stream is a combination of two major streams within the process area, viz.
- a. The "North Ditch" (which is actually a covered conduit for half its course). This ditch receives about half the rain water, the once-thru cooling water, sludge from the water clarifier, regeneration waste from the softeners, boiler blow-down and waste, process and wash-up, from the crude still.

The North Ditch runs about 300 yd. into the swamp and then joins with the--
b. "Accelerator Outfall" which contains all the other process wastes, cooling tower blow-down and such rain water as does not flow thru one of the other ditches. It carries, also, all sanitary waste, after passing thru several septic tanks.

This stream contains practically all the oily wastes. It passes thru an earthen pit separator to remove most of the oil and settleable solids. The water from the separator is pumped into an Infilco "Accelerator" where it is treated with alum flocc to produce, normally, a fairly clear water with low oil content. This flocculation-sedimentation also removes, as sludge, a substantial part of the COD content of the incoming water. Sludge from the Accelerator is pumped to a large pit in the swamp between the refinery and the river, from which no significant water overflow has yet occurred in the 10 years which the unit has operated.

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OTHER WASTES:

1. Weak, 10%, caustic soda from the first stage washing of pyritic naphtha is sold to the Merichem Co. in Houston.
2. Strong, 30%, caustic from the second stage wash, containing mercaptans, is regenerated. A small slip stream goes to the ditch.
3. Spent sulfuric acid from the alkylation plant is "traded-in" to an acid manufacturer.
4. H_2S in gases and light naphthas is removed by ethanol absorption for conversion to sulfur.
5. The waste from the Detergent Alkylate Unit, mentioned above as going to the South Separator, is acidic and also contains emulsifying materials.

WASTE TESTING AND MEASUREMENT:

There is a recording flowmeter-thermometer on the inflow to the Accellator and a wier with recording level-thermometer on the North Ditch.

The Accellator outflow is sampled continuously with an automatic sampler taking 24 hr. composites. Two of these composites are analysed each week for pH, Sulfide, Chloride, Phenolic Compounds, COD, IOD, SS, and TDS.

Occasional spot samples from the North Ditch are similarly analysed.

Bi-weekly spot samples from the outfall canal near its discharge into the river get the same analysis. Their long-time records show a small, but reasonably consistent quality improvement from the mile of flow thru the outfall ditch.

They have also been testing the river itself for DO for the past year or so. Tests are taken at several stations starting above their outfall and extending well down into the ship channel where it passes thru the lake. The results are interesting, may be of some help to us, but will require more study than we had time for on this visit.

SURVEY DATA:

Average Flow, Jan.-Oct. '67: Gpm

At Time of Survey

Flow: Gpm

pH

DO

°F

North Ditch

780

720

7.2

2.0

102

Accellator

1580

1900

8.6

91

DO was not run on the Accellator outflow because their records always show an Immediate Oxygen Demand (due to sulfides). We didn't test or sample the outfall ditch at the river, which is their permit control point, because the difficult access would have taken about two hours and it was already 5 pm. Samples from the other two streams were shipped to the D of H.

The North Ditch was turbid, but carried very little visible oil and had no odor. The Accellator outflow was, at this particular time, very turbid, with large but non-settling flocs and quite dark. This is an "upset", but not uncommon, condition. The pH had jumped during the previous hour from a consistent 8.0 all day to the 8.6 which we found. In my own experience, this will upset any flocculation settling unit. We shall check these streams again when the clarifier is running normally at our first opportunity.

PLANS FOR THE FUTURE: during the next year or so, they plan to:

1. Install facilities for recovering the emulsifying compounds from the Detergent Plant waste water and putting this water into the Accellator system.
2. Arrange to pump demineralizer wastes into the Accellator system.
3. Provide facilities for feeding the FCC sour water (high in sulfide and phenolics) to the crude unit desalter where much of these contaminants will be removed.
4. Replace the inefficient earthen pit separator on the Accellator feed by a modern API separator.

RECOMMENDATIONS : None until we have had more extensive study.

Marshall Elliott
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November 3, 1967